Ordnance Areas

Description

The Ordnance Areas include three extensive artillery testing and bombing ranges used by the U.S. Navy and U.S. Army Air Corps during the World War II period. They are the Naval Gun Range, which encompasses 172,495 acres along the central corridor of the INEEL; the Arco High-Altitude Bombing Range, a 26,406-acre area to the west; and the Twin Buttes Bombing Range, which encloses 9,291 acres on the southeast periphery of the INEEL (see Figure 2 on page 15). Activities that left ordnance behind included aerial bombing practice, naval artillery testing, explosives storage bunker testing, and ordnance disposal. Munitions used for bombing and target practice are likely to be inert; however, it is suspected that some UXO might be present within the ranges.

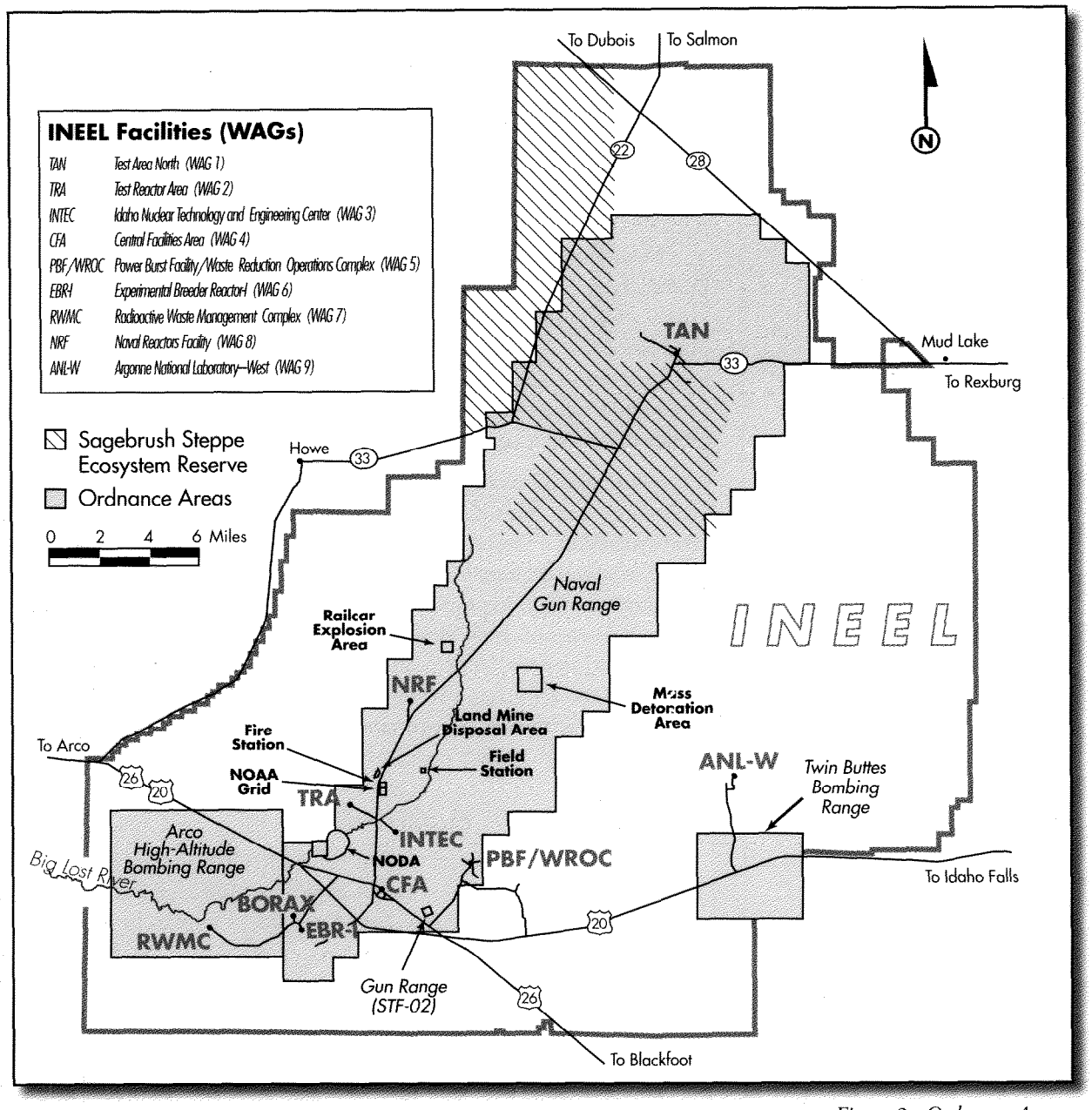

Figure 2. Ordnance Areas.

Activities involving explosives testing and ordnance disposal used "live" ordnance. There are six sites within the Naval Gun Range that were used for explosives testing: the Railcar Explosion Area, NODA, NOAA, Experimental Field Station, Land Mine Disposal Area, and the Mass Detonation Area. Although UXO has previously been detected and cleared from these sites, the extent of potential UXO outside these areas has not been determined. Because of the uncertainty of the locations in which testing and ordnance disposal took place, the entire 208,000 acres (325 square miles) may contain unexploded ordnance. The TNT/RDX Contamination Sites are located within the Naval Gun Range Ordnance Area. As a result, the remedial action selected for the TNT/RDX contaminated soil will be conducted within this Ordnance Area along with the UXO removal.

Human health risks cannot be calculated for unexploded ordnance in the same way that they are for chemical contamination. Instead, the need for cleanup is based on an assessment of physical danger. Unexploded ordnance poses a physical danger through the possibility of it exploding when it is handled or contacted, especially by machinery. Unexploded ordnance encounters are relatively uncommon, and there has never been an accidental detonation at the INEEL caused by human contact. No historical occurrences of unintentional detonation by ecological receptors have been recorded. It would be unlikely for an ecological receptor to strike an ordnance item with sufficient force to explode it. Therefore, unexploded ordnance poses no unacceptable risk to ecological receptors.

Previous geophysical surveys and cleanup actions in the Ordnance Areas have already detected and removed hundreds of pieces of ordnance, such as naval projectiles, anti-tank mines, bombs, and depth charges. Most of this ordnance was not "live". The previous removals were limited to areas known to have been heavily used for testing, or areas that were needed for INEEL research activities. These areas constitute less than 1% of the total 325 square miles that were used.

Geophysical investigations for buried munitions are seldom 100% effective. In many cases a munition is buried too deep, is too small to be detected, or is constructed of a material difficult to detect. It is also difficult to distinguish small, shallow fragments and deeper, larger intact munitions. Undetected ordnance that is buried may be brought to the ground surface through frost heaving or erosion processes. In addition, because the total amount of munitions buried at a site is almost never known, complete recovery cannot be documented. Therefore periodic surveys may be required and institutional controls established and maintained. Complete details about the investigation of these areas are in Section 12 of the RI/FS.

Evaluation of Alternatives

Three alternatives were developed for the Ordnance Areas. One of them, Alternative 1 (No Action), was not considered for selection because it would not meet the threshold criteria for protection of human health and the environment and compliance with laws. However, the No Action Alternative was evaluated in detail to provide a baseline for comparison of the alternatives as required under CERCLA. Sections 20, 21, and 22 of the RI/FS provide complete details about the alternatives. Evaluation of the remaining two alternatives led to the selection of Alternative 3 – UXO Detection and

Removal, and Institutional Controls as the preferred alternative for the Ordnance Areas.

Alternative 1 – No Action

Description. Under the No Action Alternative, no cleanup action of any type would be performed. Environmental monitoring and 5-year reviews would be carried out.

Evaluation. The No Action Alternative would not meet the threshold criteria for protection of human health and the environment and compliance with laws. Long-term effectiveness would be low, because contaminated soil would remain. This alternative would not reduce toxicity, mobility, or volume through treatment. Short-term effectiveness would be high, because no handling or transport of contaminants would be required. Implementability would be high, because annual environmental monitoring inspections and 5-year reviews are already in place. The estimated $2.4 million cost would result mainly from long-term monitoring, which would be required for at least 100 years.

Alternative 2 – Limited Action and Institutional Controls

Description. The limited Action alternative includes maintenance and monitoring of institutional controls such as access restrictions, warning signs, and security inspections. In addition, this alternative would include surveys to detect and actions to remove unexploded ordnance in areas whenever activity such as construction or development is planned. To the extent possible, the INEEL sights new construction within the areas of existing facilities or within the identified industrial corridor. Anticipated new activities generally relate to waste stream treatment and environmental restoration of past operations, and all construction or development activities outside existing facility areas will require a UXO survey before startup. UXO detection capability can be concentrated sufficiently to provide assurance that all UXO has been detected and removed in the area being surveyed. The effectiveness of the limited action would be evaluated by the Agencies during subsequent 5-year reviews.

Evaluation. Alternative 2 would meet the threshold requirements for protection of human health and the environment, and compliance with laws. Long-term effectiveness would be moderate. This alternative would not reduce toxicity, mobility, or volume through treatment. Short-term effectiveness would be moderate, because there would be some risk to personnel whenever surveys and removal actions were required. Implementability would be high, because relatively few actions would be required, and personnel and equipment for detection and removal are readily available. The estimated cost for this alternative is $5.2 million.

Alternative 3 – UXO Detection and Removal, and Institutional Controls

Description. In addition to institutional controls, Alternative 3 would involve surveys to locate, remove, and dispose of unexploded ordnance. Actions under this alternative would include performing surveys to detect unexploded ordnance in select areas where known ordnance testing occurred with live ordnance, specifically the Railcar Explosion Area, NODA, NOAA, Experimental Field Station, Land Mine Disposal Area, and the Mass Detonation Area. Although some UXO has previously been detected and

cleared from these areas, it is likely that some remains. Unexploded ordinance may also be found adjacent to the areas previously cleared because of the limited actions taken and limitations associated with older detection technologies. New detection technologies are evolving rapidly. New technologies such as airborne magnetic, multispectral, pre-dawn thermal infrared, and radar will be researched to select an appropriate site-specific technology to enhance the detection of ordnance. Specific selected areas will first be investigated for verification of the technology.

The location of the firing fan and bombing ranges from World War II activities are based primarily on historic data from World War II era documents and is supported by ground observations. Significant uncertainty exists with respect to the extent and boundaries of these areas. The survey technology, selected and verified as appropriate at the selected areas of known ordnance activity, will be used to better define the extent and boundaries of the firing fan and bombing ranges. Locations of probable ordnance detections found during the surveys will be logged. Locations will be confirmed and ordnance cleared as appropriate.

Table 3. Comparison of alternatives for the Ordnance Areas.

Criterion	1 *No Action*	2 *Limited Action and Institutional Controls*	3 *Detection, Removal, and Institutional Controls* ☑
Threshold Criteria [a]			
Overall protection	(N)	(Y)	(Y)
Compliance with laws	(N)	(Y)	(Y)
Balancing Criteria			
Long-term effectiveness	○	◒	●
Reduction of toxicity, mobility, or volume through treatment	○	○	◒
Short-term effectiveness	●	◒	◒
Implementability	●	●	●
Cost (in millions) [b]			
Capital costs	$0.2	$1.0	$12.1
Operating and maintenance costs	$2.2	$4.2	$4.4
Total Cost	$2.4	$5.2	$16.5

a. An alternative must meet both threshold criteria or it cannot be selected. An alternative either fully satisfies a threshold criterion or does not.

b. Costs are estimated and rounded. Costs are in net present value.

☑ Indicates the preferred alternative
(Y) Yes, meets criterion
(N) No, does not meet criterion
● High, most satisfies criterion
◒ Moderate, satisfies criterion
○ Low, least satisfies criterion

The need for additional surveys or removal actions would be assessed during the 5-year reviews. INEEL-wide access restrictions, such as institutional controls, will be necessary as long as an unacceptable risk remains.

Evaluation. Alternative 3 would meet the threshold requirements for protection of human health and the environment, and compliance with laws. Long-term effectiveness is high, because detected unexploded ordnance would be removed and detonated, or detonated in place if too high a risk is associated with removal. Reduction of toxicity, mobility, and volume through treatment would be moderate, because some unexploded ordnance may remain if the available detection technologies are less than 100% efficient. Short-term effectiveness would be moderate, because INEEL personnel would have some exposure risks during excavation and removal of unexploded ordnance. Implementability would be high, because equipment for unexploded ordnance detection and removal is readily available. The estimated cost for Alternative 3 is $16.5 million.

Preferred Alternative for the Ordnance Areas

Table 3 (on page 18) summarizes the evaluation of alternatives for the Ordnance Areas. The preferred alternative for the Ordnance Areas is Alternative 3 – UXO Detection and Removal, and Institutional Controls.

Alternative 3, the preferred alternative, would protect human health and the environment and comply with laws. It would have high long-term effectiveness, because it would remove the detected unexploded ordnance. Reduction of toxicity, mobility, and volume would be moderate. Short-term effectiveness and implementability would be moderate. The estimated cost is $16.5 million.

Compared to Alternative 2, the only other alternative that would meet the threshold criteria, Alternative 3 would have higher long-term effectiveness. Its ranking for reduction of toxicity, mobility, or volume through treatment is higher than Alternative 2. The short-term effectiveness is the same, and its implementability is lower. The estimated cost is much higher than the other alternative that would meet threshold criteria, because it actively removes the hazard and reduces the risk.

Based on the information available at this time, the Agencies believe the preferred alternative would be protective of human health and the environment, would comply with laws, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The preferred alternative may be modified or changed by the Agencies in response to public comment or new information.

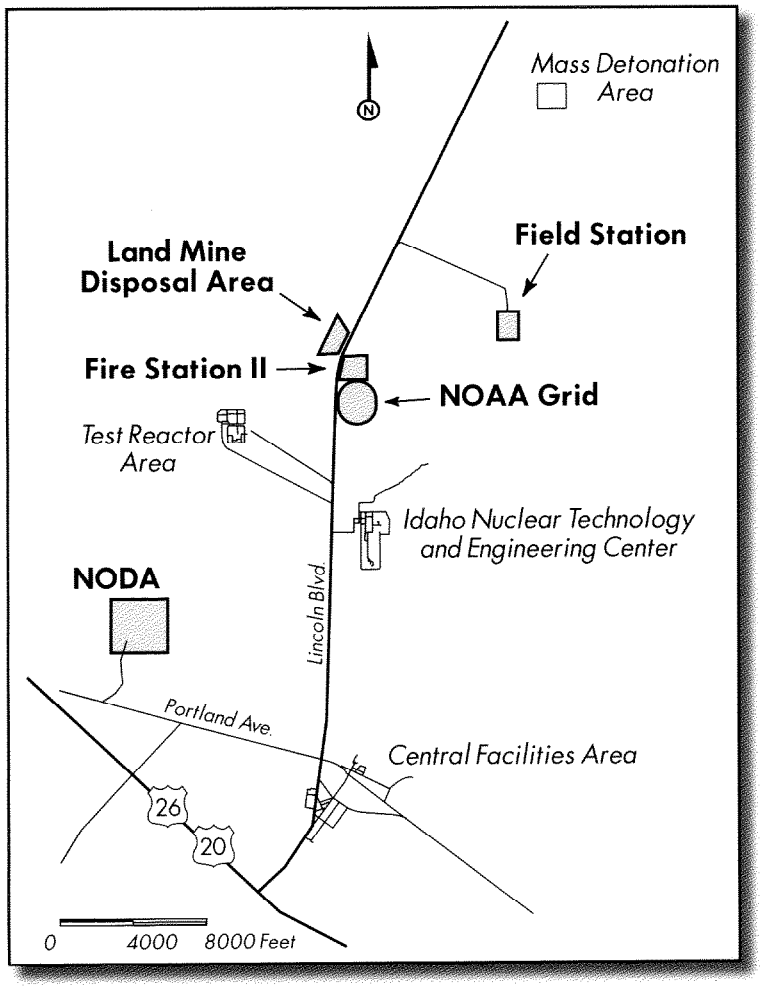

Figure 3. TNT/RDX Contamination Sites.

TNT/RDX Contamination Sites

Description

The five TNT/RDX Contamination Sites contain soil contaminated with TNT or RDX or both (see Figure 3 on page 20). Dinitrotoluene or dinitrobenzene may also be present as contaminants. The contamination ranges from fine particles staining the soil to scattered lumps and fragments. Soil sampling programs carried out between 1997 and 2000 showed that the contamination occurs in small regions scattered far apart. Concentrations in these regions range from very low to very high. The soil contamination is primarily within the top 8 inches, although in a few locations the contamination extends to 2 feet below soil surface. The TNT/RDX Contamination Sites are located within the Naval Gun Range Ordnance Area, and may still contain unexploded ordnance. Remedial efforts used to locate and remove possible UXO will also apply at the TNT/RDX contaminated sites.

The Field Station, named after an adjacent but unrelated facility, is a 5-acre area about 2 miles north-northeast of INTEC. Multiple craters within the site area probably result from ordnance destruction or testing. The volume of contaminated soil that must be remediated at this site is an estimated 10 yd^3.

The Fire Station, so named because it is adjacent to an INEEL Fire Department training area, covers approximately 33 acres. Low-order bomb detonations at the site scattered unexploded ordnance and pieces of explosives. Some of the unexploded ordnance was removed during the 1993 and 1997 activities. The volume of contaminated soil that must be remediated at this site is an estimated 150 yd^3.

About one-half mile north of the Fire Station is the Land Mine Disposal Area. This 30-acre site was used for disposal of land mine pressure plates and aerial bomb packaging materials. Land mine fuses were also burned following disposal practices accepted at the time. Unexploded ordnance was removed from this site during the 1996 and 1997 activities. The volume of contaminated soil that must be remediated at this site is an estimated 240 yd^3.

South of and adjacent to the Fire Station is the NOAA Grid. The 63-acre site was probably used for ordnance testing, ordnance destruction, or both. The site contains some small craters and widely scattered pieces of explosives including bomb casings and detonators. Unexploded ordnance was removed during the 1993 and 1997 activities. The volume of contaminated soil that must be remediated at this site is an estimated 370 yd^3.

The Naval Ordnance Disposal Area (NODA), about 2 miles south-southwest of INTEC, was used during the 1940s for disposal of ordnance and nonradioactive hazardous material. Unexploded ordnance removal activities were conducted in 1994, 1995, and 1997 at the site. Only two acres of the 138-acre site pose a risk to human health and the environment. The volume of contaminated soil that must be remediated at this site is an estimated 30 yd^3.

info The Mass Detonation Area is the designated location for disposal by detonation of unexploded ordnance and explosives debris. The 796-acre area is about 3 miles northeast of the Field Station area.

info The NOAA Grid is used by the National Oceanic and Atmospheric Administration and other government agencies for atmospheric, geodetic, and weather-related monitoring and research work.

Table 4 (below) lists the contaminants of concern for the five TNT/RDX Contamination Sites. The human health risk concern at the TNT/RDX Contamination Sites is primarily from TNT. The ecological risk concerns at these sites are from TNT as well as RDX, 1,3-dinitrobenzene, and 2,4-dinitrotoluene. Cleanup actions that protect human health from risks posed by TNT will protect ecological receptors from risks posed by all the contaminants of concern. Complete details about the investigation of these sites are in Section 12 of the RI/FS.

Table 4. Risk assessment data for the TNT/RDX Contamination Sites. [a]

Contaminant of Concern	**Detected Concentration (mg/kg)**			**Maximum Acceptable Level [b] (mg/kg)**	**Risk**		
					Human Health		**Ecological**
					Future Residential Scenario		
	Minimum	Maximum	Average		Excess Cancer Risk	Exposure Pathway	Maximum Hazard Quotient
Field Station							
TNT	0.28	1,100	151	16	9 in 100,000	Ingestion of homegrown produce	300
1,3-dinitrobenzene	0.22	14	5	6.1	— [c]	— [c]	80
Fire Station							
TNT	0.20	130	16.6	16	1 in 10,000	Ingestion of homegrown produce	40
RDX	0.23	3.7	1.2	4.4	— [c]	— [c]	40
Land Mine Disposal Area							
TNT	0.26	79,000	8,610	16	6 in 1,000	Ingestion of homegrown produce, soil, and groundwater; and dermal absorption	10,000
NOAA Grid							
TNT	0.20	1,900 [d]	489	16	1 in 1,000	Ingestion of homegrown produce, soil, and groundwater; and dermal absorption	500
RDX	0.22	1.78 [d]	1.8	4.4	— [e]	— [e]	20
1,3-dinitrobenzene	0.22	27	6.8	6.1	— [c]	— [c]	200
NODA							
RDX	0.22	328	13.4	4.4	2 in 100	Ingestion of homegrown produce and groundwater	4,000

mg/kg = milligrams per kilogram

a. Data is from RI/FS Sections 12.4 and 14.9, and Appendices E and F.

b. The maximum acceptable level, also known as the preliminary remediation goal for human health, will be used to evaluate all contaminants and is considered protective of ecological receptors for these contaminants (see RI/FS Appendix K).

c. The maximum concentration of this contaminant is below the threshold calculated to pose a risk to human health.

d. The figure given is the 95% upper confidence level. The way this is calculated is explained in Section C-1.3 of the RI/FS.

e. The human health risk from this contaminant was assessed collectively with the risk from TNT, the primary contributor to risk (RI/FS Appendix D, Section D.1.1.3).

Evaluation of Alternatives

Four alternatives were developed for the TNT/RDX Contamination Sites. Alternatives 3 and 4 each contained two variations: Alternatives 3a, 3b, 4a, and 4b. Alternatives 1 (No Action) and 2 (Limited Action) were not considered for selection because they would not meet the threshold criteria for protection of human health and the environment and compliance with laws. However, the No Action Alternative was evaluated in detail to provide a baseline for comparison of the alternatives as required under CERCLA. Sections 20, 21, and 22 of the RI/FS provide complete details about the alternatives. Evaluation of the alternatives led to the selection of Alternative 3a – Removal, Treatment of TNT/RDX Fragments, On-Site Disposal of Soil, and Institutional Controls as the preferred alternative for the TNT/RDX Contamination Sites.

It is important to note that the goal of CERCLA is not to eliminate risk, but to reduce it to an acceptable level. However, for various reasons, complete restoration or clearance to levels acceptable for unrestricted use cannot be accomplished at some TNT/RDX Contamination Sites. Consequently, institutional controls will be needed to ensure that the selected remedies will remain protective.

Alternative 1 – No Action

Description. Under the No Action Alternative, no cleanup action of any type would be performed. Environmental monitoring and 5-year reviews would be carried out.

Evaluation. The No Action Alternative would not meet the threshold criteria for protection of human health and the environment and compliance with laws. Long-term effectiveness would be low, because contaminated soil would remain. This alternative would not reduce toxicity, mobility, or volume through treatment. Short-term effectiveness would be high, because no handling or transport of contaminants would be required. Implementability would be high, because annual environmental monitoring inspections and 5-year reviews are already in place. The estimated $3.5 million cost would result mainly from long-term monitoring, which would be required for at least 100 years.

Alternatives 3a and 3b – Removal, Treatment of TNT/RDX Fragments, Disposal of Soil, and Institutional Controls

Description. Alternative 3 would consist of removal, treatment, and disposal of contaminated soil, institutional controls, and monitoring. Two variations of Alternative 3 were developed, differing in whether disposal would be ***on-site*** (Alternative 3a) or ***off-site*** (Alternative 3b).

Under Alternative 3, the estimated 800 yd^3 of contaminated soil would be excavated most likely by hand because contamination is visually identifiable. This would minimize the volume of soil being removed and limit environmental disturbance. Use of analytical field methods can be applied to assist in determining the magnitude of excavation necessary such as contaminant depth and aerial extent. Lumps and fragments of TNT and RDX would be segregated from the soil and disposed of by detonation at the Mass Detonation Area. Detonation of the fragments will be complete, leaving behind no hazardous residuals. The contaminated soil would be transported to a disposal facility and each site would be recontoured and revegetated as needed. Excavations deeper than one foot would first be backfilled with clean soil.

Alternative 4c involved excavating the contaminated soil (leaving in the TNT/RDX fragments), treatment by composting, and returning the treated soil to the excavation sites. However, under this alternative, the contaminated soil would be pretreated prior to composting using a solvent, such as acetone, to dissolve the fragments of TNT and RDX. Once the soil was returned, the site would remain under institutional controls due to potential UXO issues and the possibility for undetected TNT/RDX fragments. Alternative 4c was eliminated during preliminary evaluation due to safety concerns about the quantity of hazardous and toxic solvents required, the expense, and the time required.

on-site
Disposal occurring within the geographical boundaries of the INEEL.

off-site
Disposal occurring outside the geographical boundaries of the INEEL.

Any UXO detected through survey, if performed, would be safely removed and detonated at MDA. (This area will be cleaned up after all other UXO contaminated areas have been remediated using the same remediation alternatives.) However, if the detected UXO cannot be removed safely then it will be detonated at the site where it was detected. Detonation of UXO only leaves inert metal debris. Buried TNT/RDX fragments may remain undetected if excavation of contaminated soil is performed by hand at areas with visible contamination, therefore, restoration or clearance of contaminated soils to levels acceptable for unrestricted use may not be accomplished, and institutional controls and long-term monitoring would be implemented. Long-term activities may include inspecting formerly contaminated areas for remedy effectiveness, enforcing access restrictions, and generally providing responsible long-term care of the sites to prevent inadvertent disturbance.

Under Alternative 3a, the contaminated soil would be transported to an on-site landfill, such as the CFA landfill. Under Alternative 3b, the contaminated soil would be shipped to an off-site disposal facility, such as the Waste Management Northwest landfill. This landfill is approximately 550 miles west of the INEEL in Arlington, Oregon. Landfills for disposal of TNT and RDX contaminated soil must meet the criteria for disposal of industrial waste.

Evaluation. Alternative 3 would meet the threshold criteria for protection of human health and the environment and compliance with laws. Long-term effectiveness would be high, because contaminated soil would be removed. Reduction of toxicity, mobility, and volume through treatment would be moderate; although TNT and RDX fragments would be detonated, the remaining contaminated soil would not be treated but only removed.

Short-term effectiveness would be moderate, because personnel could be exposed to chemical contaminants during excavation, treatment, transport, and disposal activities. Implementability of Alternative 3 would be high because equipment, technologies, and personnel are all readily available. The estimated cost for Alternative 3a is $4.3 million. The estimated cost of Alternative 3b is $4.4 million. Each estimated cost includes excavation, transportation, and payment of a one-time disposal facility fee (a fixed price per cubic yard). The Alternative 3b cost would be slightly higher because of the additional cost to transport soil several hundred miles to an off-site disposal facility.

Alternatives 4a and 4b – Removal, Treatment of TNT/RDX Fragments and Soil, Disposal or Return of Soil, and Institutional Controls

Description. Alternative 4 would consist of removal, treatment, and disposal or return to the excavation of the contaminated soil. Under Alternative 4, surveys for and removal of unexploded ordnance would be performed, if required prior to soil removal activities. Two variations of Alternative 4 were evaluated, differing in whether treatment would be incineration (Alternative 4a) or composting (Alternative 4b). In Alternative 4a, incineration and disposal would take place off-site. The composting for Alternative 4b would take place on-site.

As with Alternative 3, the 800 yd^3 of contaminated soil would be excavated most likely by hand, and the fragments of TNT and RDX would be segregated from the soil and transported to the Mass Detonation Area for detonation.

Remediation of these sites will produce secondary waste from activities such as sampling and monitoring. This waste could include contaminated sampling equipment, personal protective equipment, and laboratory samples. Any such waste will be stored near the area where it was generated. These wastes will be treated or disposed of at an approved facility within the INEEL boundaries.

The remaining soil would be transported off-site, treated and disposed of (Alternative 4a) or treated on-site using composting and returned to the excavations (Alternative 4b). Buried TNT/RDX fragments may remain undetected if excavation of contaminated soil is performed by hand at areas with visible contamination, therefore restoration or clearance of contaminated soils to levels acceptable for unrestricted use may not be accomplished and institutional controls and long-term monitoring would be implemented.

Under Alternative 4a, the contaminated soil would be transported to an off-site facility, such as the Onyx Environmental Services Treatment Complex in Port Arthur, Texas approximately 1,100 miles south-southeast of the INEEL, where it would be incinerated to destroy the contamination. Excavations more than 1 foot deep would be backfilled with clean soil and revegetated.

Under Alternative 4b, the contaminated soil would be treated by composting, which would allow microbes to break down the contaminants into harmless compounds. The excavated soil would be transported to a temporary portable building erected on-site. The building would provide a controlled environment. The soil would be amended with organic material (such as manure, potato waste, alfalfa, and sawdust), placed into windrows, and mixed several times a day. Composting would take approximately 15 days. After composting, the soil would be returned to the excavations, and each site would be recontoured and revegetated as needed.

Evaluation. Alternative 4 would protect human health and the environment and comply with laws. Long-term effectiveness would be high, because all contamination would be removed from the sites. Reduction of toxicity, mobility, and volume through treatment would be high, because contaminants would be destroyed. Short-term effectiveness would be moderate, because equipment operators and INEEL personnel could be exposed during excavation, transportation, treatment, and disposal. Implementability of Alternative 4a would be high, because the off-site disposal facility, services, and materials are all readily available. Implementability of Alternative 4b would be moderate, because of the need to procure materials and equipment for composting. The estimated cost of Alternative 4a is $5.2 million. The estimated cost of Alternative 4b is $5.0 million. Each estimated cost includes excavation and transportation. The estimated cost of Alternative 4a also includes payment of a one-time disposal facility fee (a fixed price per cubic yard). The Alternative 4a cost would be higher because of the additional cost to transport soil several hundred miles to an off-site disposal facility.

Preferred Alternative for the TNT/RDX Contamination Sites

Table 5 (on page 25) summarizes the evaluation of alternatives for the TNT/RDX Contamination Sites. The preferred alternative for the TNT/RDX Contamination Sites is Alternative 3a – Removal, Treatment of TNT/RDX Fragments, On-Site Disposal of Soil, and Institutional Controls. It would protect human health and the environment and comply with laws. It would have high long-term effectiveness because it would remove identifiable TNT/RDX contamination and institutional controls would prevent exposure to any residual contamination. Reduction of toxicity, mobility, and volume would be moderate; although TNT and RDX fragments would be detonated, the rest of the contaminated soil would be removed but not treated. However,

Table 5. Comparison of alternatives for the TNT/RDX Contamination Areas.

Criterion	1 No Action	3a Removal, Treatment, On-Site Disposal of Soil, and Institutional Controls ✓	3b Removal, Treatment, Off-Site Disposal of Soil, and Institutional Controls	4a Removal, Incineration, Off-site Disposal of Soil, and Institutional Controls	4b Removal, Composting, Return of Soil, and Institutional Controls
Threshold Criteria [a]					
Overall protection	N	Y	Y	Y	Y
Compliance with laws	N	Y	Y	Y	Y
Balancing Criteria					
Long-term effectiveness	○	●	●	●	●
Reduction of toxicity, mobility, or volume through treatment	○	◒	◒	●	●
Short-term effectiveness	●	◒	◒	◒	◒
Implementability	●	●	●	●	◒
Cost (in millions) [b]					
Capital costs	$0.6	$1.7	$1.8	$2.6	$2.4
Operating and maintenance costs	$2.9	$2.6	$2.6	$2.6	$2.6
Total Cost	$3.5	$4.3	$4.4	$5.2	$5.0

a. An alternative must meet both threshold criteria or it cannot be selected. An alternative either fully satisfies a threshold criterion or does not.

b. Costs are estimated and rounded. Costs are in net present value.

✓ Indicates the preferred alternative
Y Yes, meets criterion
N No, does not meet criterion
● High, most satisfies criterion
◒ Moderate, satisfies criterion
○ Low, least satisfies criterion

the contaminants would be contained, protecting humans and ecological receptors from exposure. Short-term effectiveness would be moderate, because of the possibility for worker exposure during excavation, treatment, transport, and disposal activities. Implementability of Alternative 3 would be high because equipment, technologies, and personnel are all available.

Compared to the other alternatives that would meet the threshold criteria (3b, 4a, and 4b), Alternative 3a would have the same long-term effectiveness and the same short-term effectiveness. Its ranking for reduction of toxicity, mobility, or volume through treatment is the same as for Alternative 3b, but lower than Alternatives 4a and 4b, because it does not treat the contaminated soil. Its implementability is the same as Alternatives 3b and 4a, and greater than Alternative 4b. The estimated $4.3 million cost is the lowest of the four alternatives that would meet threshold criteria.

Based on the information available at this time, the Agencies believe the preferred alternative would be protective of human health and the environment, would comply with laws, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The preferred alternative may be modified or changed by the Agencies in response to public comment or new information.